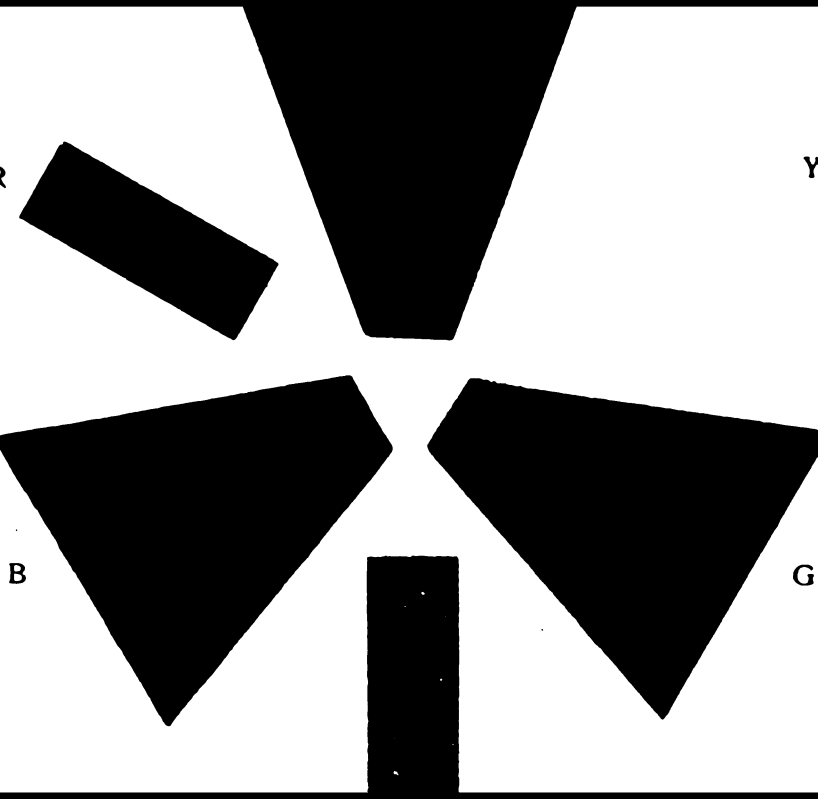

Colour-sense training and colour using

E. J. Taylor

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and

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Colour-Sense Training and Colour Using

BY

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BLACKIE & SON, LIMITED, 50 OLD BAILEY, E.C.
GLASGOW DUBLIN BOMBAY
1908

Preface

"Can colour be taught?" is often asked. Most assuredly "yes". All, except the colour-blind, possessing as they do the normal power of colour discrimination, have in them the possibilities of great achievement.

This little book makes no pretence to be a complete text-book on the wide and increasingly important subject of Colour, but in it I do claim to suggest to my colleagues in the Teaching Profession a rational, scientific, and highly practical method of colour-sense training from the dawn of colour consciousness onwards through the one and continuous process of development; and also to present to my fellow Art Students in a clear, logical, and possibly attractive form such knowledge of the fundamental facts underlying the science as will enable them, if not to become great colourists, at least to avoid mistakes. For such a book, then, no apology is needed. It is the outcome of a course of short suitable lessons originally arranged as a progressive

series for elementary day classes and evening students. The little volume is an exposition rather than a proof; but, knowing as I do my colleagues, I have endeavoured, without overburdening the pages, to justify each step as set forth in the text, and would refer the reader for further light to the exhaustive treatises of Prof. Church, James Ward, O. N. Rood, L. F. Day, Grant Allen, of which I have made use, and, I hope, adequate acknowledgment.

E. J. T.

February, 1908.

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Colour-Sense Training and Colour Using

CHAPTER I

COLOUR: ITS CLAIMS

The realm of colour!

At every turn, Nature, having constituted and endowed us with a love of colour, pleasantly presents it to our eyes through flowers and foliage, birds and insects, fishes and shells, sea and sky. And the universal and certain result of this insatiable desire is, that almost every object of human industry is affected by it, for through Art too, man stimulates and gratifies the fancy through pictures and pottery, stained glass and furniture, carpets and hangings, dress and jewellery.

A knowledge of the principles of harmonious colouring is then at least desirable. Nay more, for as Art aims at producing

the beautiful in things—the half of our nature — beautiful in form, design, fitness, colour, and as the colour is part and parcel of the thing beautified and not an afterthought, such knowledge is a necessary adjunct.

But apart from the prospective great utilitarian value of such knowledge in the industrial world, it is the educational value of a subject, that is, as a developing and socializing agent, which admits it to a school curriculum, and though colour has casually found a subordinate place here, it has not and does not play so important a part as its value demands. The Board of Education,[1] however, have advocated for it greater consideration and use than heretofore, as, for instance: "The important aim of cultivating the æsthetic side of a scholar's nature"; "The scholars should be taught to perceive beauty of form and colour. The feeling for beauty should be treated as a serious school matter; it cannot be left to chance or caprice"; "Nor should we omit the formation of taste", and so on.

[1] *I.e.* in the "Suggestions".

A bright colour immediately wins the attention of a child, hence its great value as an arouser and sustainer of interest, the indispensable and all-sufficient condition to faculty-training, and therefore to knowledge-getting. Colour emphasizes form and size, and enables the eye to more readily separate objects and their parts. It aids in determining distance and space, and leads to an appreciation of fine things and to a knowledge of the elements which make for refinement.

"There is no element in our sensuous nature which yields us greater or more varied pleasure than the perception of colour." "The pleasure of colour is one which raises itself above the common level of monopolist gratification, and attains to the higher plane of æsthetic delight."[1] In short, it forms a necessary part of one's general culture, *i.e.* on the æsthetic or artistic side.

But as in every other subject of the curricula, first the massive, then the dainty; wholes, then parts; mass, then detail; simple, then complex; strong contrasts, then subtle

[1] Grant Allen.

harmonies; broad features, then minor details; primary, then secondary;—this is the truly educational method of procedure.

The universal adoption of the brush as an instrument of expression has naturally led to a more universal use of colour. Yet the instruction given is not generally presented in a sufficiently systematic, easily graduated, or logical, and therefore not in an educational order. It must be given mainly in connection with and should develop from brush-work. The knowledge should be gradually introduced at such points in the progress of the brushwork lesson as it naturally arises. It is plain, then, that colour-training and instruction must be given through material colours or paints.

Now, ideal progress is impossible so long as the instruction is based on the erroneous idea that the three primary colours are red, yellow, and blue. This theory has so long held sway, and has been so generally accepted by art teachers and others as the only practical basis, that to refute it will be regarded as rank heresy. Nevertheless, this pigment theory is quite useless for purposes

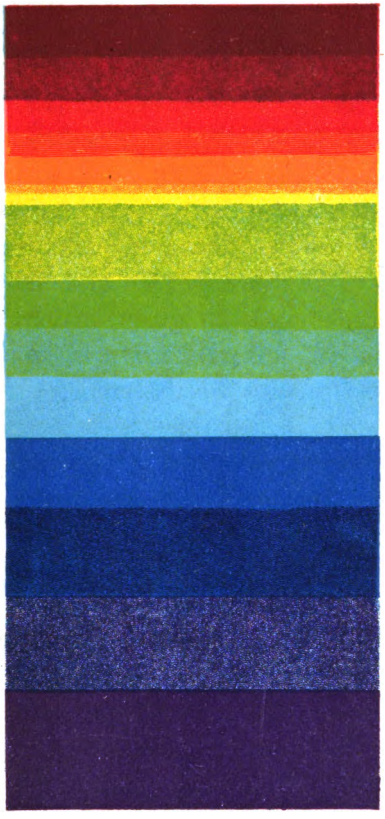

DIAGRAM 1

THE SOLAR SPECTRUM

of colour-sense *training*, if not absolutely injurious.

Sir Isaac Newton believed, and Sir David Brewster added the weight of his great scientific authority to the belief, that the solar spectrum (Diag. 1) consisted of three overlapping layers of red, yellow, and blue bands; that the orange was formed by the overlapping of the red and yellow, green by the overlapping yellow and blue, and purple by the red and blue. This Red-yellow-blue or Brewster theory, as it is called, has been disproved. Every colour in the spectrum is as much a primary as red or yellow or blue, because it is produced by light waves of a definite length, and though each primary colour-sensation is excited in *some* degree by almost every ray of the spectrum, each is practically a simple, definite, and primitive colour.

"But", a doubter answers, "the theory is confirmed by the practical use of paints. How do you account for the fact that when one mixes yellow and blue paints the result is green, which is the complementary to the red; and further, if two gelatine films, yellow

and blue, be held between the light and the eye, the result is again green?"

Well, the first result is due to an accident, the accident that the colours used are impure. As yet, absolutely pure colours are an impossibility. Take Prussian Blue and Gamboge for example, so often chosen to prove that blue and yellow together make green. Each of these pigments contains a large amount of green, and in a mixture of the two, the light falling upon it penetrates a little way into the interior, is there reflected among the particles, undergoes an absorbing or sifting process, and part emerges, and by this emergent light we see the colour, name it, and know it. In this passage through the particles of the mixture, then, all the rays not contained by the other have been absorbed, neutralized, or quenched, not combined, and as green are the only particles common to both, the result is green.

Now, take one of the purest yellows, Yellow Cadmium, and mix it with the purest blue, genuine Ultramarine. A colour containing very little green will be obtained, notwithstanding the power of the two colours used.

Pure yellow and blue, as in light rays, when mixed, produce white, never green. Thus, as tested by paints, the very excellencies of the red-yellow-blue method depend upon the defects in the colours used. The further from blue the blue is, the better the result.

To prove (!) also by the use of films that yellow and blue when combined make green, is playing false. Here again is no combination at all, but rather, as before, a subtraction, the green being the *residue* after the filtration by the films of the compound white light.

Furthermore, to build upon the theory is opposed to the psychological truths that it is only the glaring and startling effects which appeal at first to the untrained mind, that æsthetic appreciation grows very slowly, and that it takes years to train.

The knowledge of colour cannot be presented through it in sufficiently simple and progressive stages, for immediately one begins to mix paints the resulting hues are not so impressive, and therefore not so attractive to children. At two magic bounds a pupil is transferred from his gay child-world of brilliant reds, bright yellows, and deep blues, to

the mature-minded artist's quiet atmosphere of tender russets, soft citrines, and delicate olives! It is magnificent, but it is not education. After the child's first fairy tale and nursery rhyme, why not immediately expound to him the hidden beauties of *Hamlet* or the *Moonlight Sonata*?

The system also has led to the universal and almost exclusive use of a number of vague technical terms describing, among others, the so-called Tertiary hues as Russet, Citrine, Buff, which mean nothing to children.

Finally, the so-called Secondaries, or Complementaries of the so-called Primaries, are not complementaries.

As to the basis of the training and instruction, the Board of Education again speaks plainly: "Something of an elementary nature should be said about the *scientific* principles of harmony and contrast of colour". How is it possible for any red-yellow-blue theorist teacher to do this? It is his business to build on the bed-rock. He asks the why and wherefore, and reasonably correlates his subjects to secure uniformity of aim and "accumulative force", in the case of colour,

with his science lesson on Light, where the connection will be fully worked out, thus bringing each to the help of the other. He anticipates the deeper physics of the secondary school and the dye-vat of the technical school, whence his pupils shall be called upon to confirm and augment, to utilize and apply, the instruction gained in the elementary school.

Altogether, the red-yellow-blue theory entirely ignores the *personal* element, which must have, after all, absolutely the first consideration in framing any rational scheme of training. Art teachers might, nay, they must, base their colour-training upon the facts and truths arrived at by their scientific brethren, Physicist and Psychologist, with natural benefit to both. Æsthetic and technical requirements are mutually beneficial, and must be simultaneously and properly presented.

CHAPTER II

THE COLOUR-SENSE

Colour is merely a sensation like smell, or sound, or taste. It has no external or

objective existence. Consequently the names of colours are abstract words, though they may be shown to have originated in every case from the names of concretes. They are adjectives used as nouns.

The existence of a colour-sense in the human eye is certain, even in that of the lowest type of man. "Man possesses a very perfect colour-sense, which is equally involved in all varieties of the species, from the highest to the lowest. A supposed linguistic proof to the contrary is not countenanced by the other facts of the case. Direct investigations show that all men have like colour-perceptions, and a historical enquiry shows that the same is true of all earlier races."[1] "When two objects are compared together for colour, the large majority of persons will agree as to their identity or difference. Their verbal descriptions of the difference may vary slightly, but practical tests show that in reality they recognize the same variations."[2] Professor Church says: "Individual sensibility to colour admits of large variations, and it is

[1] Grant Allen.

[2] Report of Committee on Colour-Vision, 1892.

susceptible of immense improvement. This cultivation of the sense of colour is rather psychological than physiological, mental rather than physical. It is not the organ of vision that is improved, but the power of interpreting and co-ordinating the sensations which it transmits to the brain." "The vast majority of persons experience, when viewing coloured lights or coloured objects, identical colour-sensations. They will arrange and classify tints and shades of all distinct hues in the same order and in the same groups. Such mistakes as they will make will be attributable to imperfect training and inexperience, or to a slight lack of sensitiveness to colour of very small brightness, or to a faulty nomenclature. There is, then, a normal or standard colour-sensation."

Why not adopt one then? What stands in the way when, gifted with language as we are, we know that the sensation or mental idea *blue* as perceived, thought, or experienced by you is the same as the sensation or mental idea perceived, thought, or experienced by me? There are recognized standards for the sensations of heat, form, sound, &c. The

musical note C is caused by a certain number of vibrations which produce a definite sensation upon the nerves of the ear. 'Tis true that the ear is peculiarly adapted in its own direction, but why should this, educationally one of the least important of the sense organs, be trained to distinguish the slightest difference between two notes as B and B♭, and that very special educational organ, the eye, neglected as regards definite colour-sensations? Says Church here again: "It would be far better if the student could have easy access to a standard set of complementary colours executed in enamels. There would be little difficulty in producing a large number of such sets, which might be suspended in all public libraries, schools of art, and picture galleries, if not in all school-rooms." The great advantages accruing from such a set provided at the very beginning of our colour studies is obvious.

A teacher points to a pupil's shawl and asks of his class: "What colour do you call this shawl?" "Red", comes the correct answer. "And this tie?" "It is red." Also correct. "And this chalk?" "Red." Again

correct, though neither tie nor chalk was the same red as the shawl. So the teacher, who is expected to form and maintain definite impressions and sensations upon the child's mind, and to provide a vocabulary to accurately describe such experiences, says: "Yes, children, you are right. They are all reds. You see there are many reds. But this one I show you now is the only correct and proper Red." He then presents to their view the best possible imitation in paint, *i.e.* a painted object, of an absolutely fixed portion of the solar spectrum which appears monochromatic, that psycho-physical unit which is by common consent called Red[1].

CHAPTER III

THE RATIONAL BASIS OF TRAINING

"When we observe children habitually noticing none but the most vivid hues, it is plain that colour studies are best begun by representing objects having positive colour,

[1] The popular conception of Red is an orange-red. True red is somewhat darker—a ruby.

and best continued by passing gradually through the study of things less positive in hue to objects distinguished by delicate and refined colouring."[1] "The earliest æsthetic objects to obtain notice will be those which most strongly excite the whole nervous organization; the more delicate and special stimulants will not be prized until a later stage of evolution. Thus children and savages are pleased with coarse excitement of a drum or tom-tom; only after careful training can they rise to comprehend the more dainty distinctions of melody and harmony."[2] "The powerful stimulation of brilliancy is sooner understood than the milder stimulation of the analytic colours."[2] "Bright hues, fragrant scents, sweet juices, these form the earliest pleasures of childhood, and remain throughout as the main sensuous factors of our sensuous nature."[2] "The simplest æsthetic feelings precede the more complex, and the vivider the fainter."[2]

Had not Froebel already done it in his first gift, the truths expressed in these extracts would have suggested the colours to

[1] "Suggestions." [2] Grant Allen.

be first presented. From the incalculable number in the spectrum he selected six, viz. Red, Orange, Yellow, Green, Blue, Violet. "Nothing approaching the hue of Indigo", says Church, "can be discerned, although from the time of Newton onwards the name Indigo has been generally applied to the coloured light which separates Blue from Violet," and even if it were present, "as the pigment Indigo in its purest state is a dull blue having a greenish cast, its place in the spectrum would certainly not be on the violet side of the blue, but rather on the side of the green. For our present purpose it will be sufficient to enumerate six colours . . . Red, Orange, Yellow, Green, Blue, Violet." The most recent statistics show that of persons examined for colour-perceptive powers, over eighty per cent are "normal", *i.e.* "six-unit", the rest having diminished colour-vision, and being mainly the males of the uneducated classes. Only one individual in several thousands sees seven colours in the spectrum.

It is certain that no child would detect indigo in a solar spectrum (Diag. 1) thrown

on a surface for inspection. What educational reason, then, in presenting an expression which has no answering experience?

On the other hand, these six form a series, a natural series, a physical series, and of course a psycho-physical series, that is, the physical series recognized by those of normal colour-perception. They are sufficiently clear, distinct, and impressive in power, yet not too great in number, to be readily recognized and even classified by four-year-olds. They are attractive and simple, and therefore suitable, offering the advantage of such elements as fully and constantly interest the learner.

Moreover, they afford opportunities for easy and well-arranged steps of progress and a simple nomenclature, and thus on the whole hold out the very best conditions and inducements for faculty-training and knowledge-getting.

These six colours of Froebel's, then, will be taken as Normals, Types, Units, Keys, Fundamentals, or Standards. Each has a fixed place in the spectrum determined by its wave-length, and is imitated as nearly as possible in paint. And as the sum of these constitutes

white light, and the absence of all of them darkness or black, these: Red, Orange, Yellow, Green, Blue, Violet, White, and Black, are the eight from which all other colours and modifications of colours can be made easily, systematically, rationally, and progressively. Kindergarten material —beads, silk and cotton thread, wool, paper, &c. &c.—should be made principally in these positive colours (with a matt or dead surface), so as to form definite impressions, sensations, and ideas upon the child's mind, no less definite than the ideas of the forms of cube, ball, and cylinder.

In "brushwork drawings of simple natural objects and common objects", "mass drawing with coloured chalks on large boards", "the use of differently coloured pieces of card in different shapes", "mosaic with coloured tablets", "matching coloured wools",[1] parquetry, weaving, &c. &c., the teacher will use these in connection with white or with others (see Complementaries, Chap. V), whence their qualities will be intensified and strengthened, or with those strong associates (Chap. VIII,

[1] "Suggestions."

p. 52) whereby they will enrich and be enriched, and their colour value remain undiminished.

To more readily refer to these eight normals, their initial letters R, O, Y, G, B, V, W, and X might be used, X being adopted for Black, as B has already been taken for Blue. (Diag. 2.)

CHAPTER IV

THE FIRST STEP IN (1) COLOUR ANALYSIS, (2) COLOUR RELATIONS, (3) COLOUR MIXING

If the solar spectrum or an enlarged coloured reproduction of it (Diag. 1) be minutely examined, it will be found that in addition to and between the six coloured normals already mentioned, other hues are to be observed to which those terms are not strictly applicable. For example, notice R and O. Trace carefully the change from R to O. It is very gradual. In so doing, one passes the line where the colour can be called R, and encroaches upon the domain of the O before arriving at the point in the band which is the part of greatest saturation of O. In

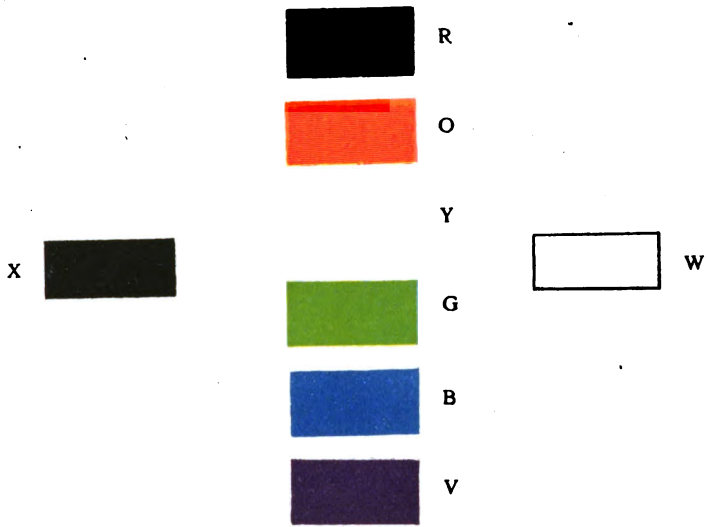

DIAGRAM 2. THE EIGHT NORMALS

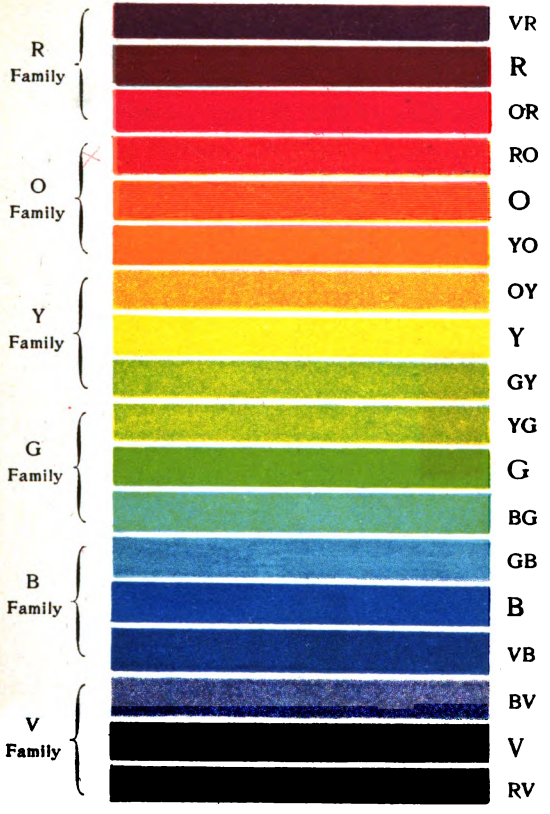

DIAGRAM 3

THE SIX COLOURED NORMALS WITH TWO INTERMEDIATE TONES OF EACH

short, one passes from a simple colour to a compound colour.

Take those two paints R and O. Cover a patch with the former, and below it, at some distance, another patch with the latter. (Diag. 3.) Now mix a little O into the R, taking care that the R is in excess. Strictly speaking, the mixture is no longer R, but a modification of it. It is, of course, an orange-red (OR). Cover a patch with this immediately under the R. Again, mix this time a little R with O, having the O in excess. This is a red-orange (RO). Place a patch of it between the OR and O. Beginning at the top, we now have the hues in this order: R, OR, RO, O. Proceed in this way with O and Y, with Y and G, with G and B, with B and V, and with V and R (but as VR is a red, placing this above the R), obtaining between each pair of normals two intermediate tones, or modified units, and always referring to them in terms of the normals as above, thus simplifying and providing a rational nomenclature, and avoiding technical terms.

This is the order in which the hues appear in the solar spectrum. It is, in fact, a simple

imitation of it, with this difference only, that the various tones in it have been separated and adjusted, and made equal in area. The amount of space covered relatively by each of these hues in the natural spectrum is shown in Diag. 1. Even this is but a rude picture when compared with the solar spectrum, for that contains an infinite gradation of hues, to attempt to name all of which would be absolutely impossible. The number is incalculable, and a diagram such as the one here given will be deemed sufficiently involved at this stage, for in addition to the simplification of the prismatic band, it enables one to present the six normals and their modifications — the whole range of colours—in families of three members each, *i.e.*:

(Reds)	(Oranges)	(Yellows)
VR, R, OR;	RO, O, YO;	OY, Y, GY;
(Greens)	(Blues)	(Violets)
YG, G, BG;	GB, B, VB;	BV, V, RV;

and thus to detect a difference between tones of the same hue.

Now there is one essential difference between the results of mixing coloured lights and those of mixing coloured paints. The

former are pure, and produce a resultant hue which has the added brightness of both its constituents. But pigments are impure, and when mixed produce a result which has a diminished brightness owing to absorption (see Chap. I). The colour-mixer then, will not be surprised when he finds his hue somewhat dull and muddy, some grey always being formed by mixture through differences in transparency or opacity, chemical components, or other qualities of the pigments used. The only pigment approaching the prismatic colour in purity is genuine Ultramarine Blue from lapis lazuli. French ultramarine (French Blue) contains some V.

CHAPTER V

THE FIRST ASSOCIATIONS OF COLOURS

Harmony has reference to the proper placing together of things to produce an agreeable effect. And this applies to colour.

When two or more colours are used in close proximity, each always has an influence upon the other, an effect called Contrast, which

may be great or small according to the selection of the hues. The most gaudy may be selected and arranged to appear more gorgeous, or, on the other hand, to have a depressing effect upon the beholder. As, then, the resulting general beauty of the combination may be enchanced or marred by affiliation, it is of the greatest importance at this early stage that only those hues should be juxtaposed which offer the greatest contrast in every way, differing as widely as possible in character, and thereby tending to vivify and strengthen each other. And, that the training and instruction may be as simple, natural, and gradual as possible, it may be well to select from the very marked hues already shown to be contained in white light those which affect the colour-sense to the greatest possible extent, for we as teachers are concerned primarily with *sensations* and *experiences*, not with paints. "Sense education comes first and foremost." And while educational ends are being attained, industrial ones also are being secured—the dyer and colour-printer are in the making.

What are the Primary Colours? Again

quoting Church in his own words: "There are many reasons mainly connected with the structure and functions of the eye which have led to the selection of certain coloured lights, generally three in number, as yielding primary colour-sensations. This primariness is then not objective, but subjective of human vision . . . red, green, blue, . . . which are now generally accepted."

The reason for the selection of red, green, and blue is briefly this: Each extremely minute portion of the retina of the eye is supposed to consist of an immense number of sets of three different nerve-terminals, each of the three fibrils of the set being specially adapted for the reception and conveyance of its own particular colour-sensation (why, we cannot even guess), and perhaps in a very much less degree to the production of the other colour-sensations, the red set being acted upon most strongly by the Red light and also a little by the other colours—Green and Blue; the Green set by green light and a very little by Red and Blue; and the Blue set by blue light and to some slight extent by Red and Green. When all three sets are

acted upon equally at the same time, *white* is the result, *i.e.* Red, Green, and Blue together make White.

This theory—Young-Helmholtz—is said to be confirmed by the physiological structure of the eye as disclosed by the microscope, and many of the various phenomena of congenital colour-blindness are also accurately explicable by it, and though no theory of colour-vision as yet *completely* accounts at one and the same time "for normal vision and congenital colour-blindness, as well as for those cases of defective colour-sense which are due to disease or injury", it was "found convenient to accept the terminology of the Young-Helmholtz theory".[1]

This theory is vastly strengthened by approaching the subject of colour psychologically and historically. Red was the earliest colour used in decoration by primitive man, and thus the first to receive a special name. Later, when two colours were used in conjunction, Blue was associated with it, that is, Red and Blue form the earliest analytic colours. Red has always been, and still is, the adjunct

[1] Royal Committee on Colour-Vision.

of state ceremony. It is, after light in its totality, the first to attract the attention of the baby in its cradle. It is *the* stimulating colour and the most pleasing, and has been the poetical colour from Homer to Tennyson.

Of Green there has always been a large amount in our natural surroundings. It is the colour that "goes with" most others. It forms the mean of the spectrum, the opposite of Red, being the necessary restful colour, the relief abundantly present in the country and welcomed as a pleasant change in the city. "As its pleasure is the least directly stimulating, the most gentle and modest of all, it naturally ranks highest of any colour in the hierarchy of the æsthetically cultivated."[1] The nervous power of the eye is sooner exhausted by strong greens than by any other colour. On the other hand, "Yellow never has risen to the same æsthetic prominence as Red, Green, and Blue".[1] It is, broadly speaking, a mere species of Red, and one of the last colours to be distinguished by an infant, the order of discrimination being firstly between White and Black, then between Red and

[1] Grant Allen.

Blue, afterwards Green and Yellow. In the first stages of colour-blindness Orange and Yellow are the first to be unrecognizable.

Select, therefore, these three very strong and widely separated colours, Red, Green, Blue, as being the most powerful of the whole range, excelling all others in strength and intensity, and hence influencing the mind most powerfully. (Diag. 4.)

Now, if we take from white light any given colour, all the remaining colours together make what is called its *complementary*; that is, the chosen colour and the complementary together *complete* white light; and not only is white light completed by the sum of *all* the hues of the spectrum, but it may also be formed by three (p. 30) or even by two selected hues.

Look intently for a few seconds at a R patch of colour on a W background. If the R be quickly withdrawn, a BG patch is seen in its place. This is known as the Accidental, Negative, or Reversed colour. The explanation is that the R fibrils of the eye were somewhat temporarily tired by continual usage, and when the R was withdrawn

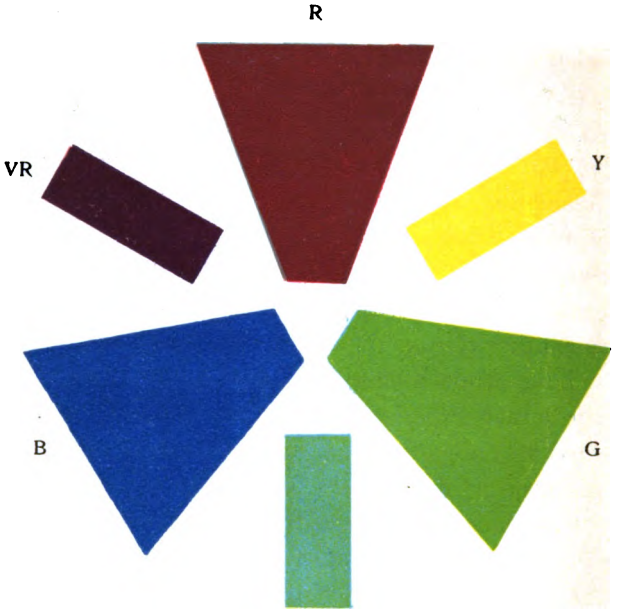

DIAGRAM 4

THE THREE PRIMARIES AND THEIR COMPLEMENTARIES

they were to some extent insensitive, and failed to respond with the vigour of the B and G fibrils, hence the BG colour. Thus R and BG are complementary colours. In the same way G and VR (Purple) are complementary, as also are B and Y. The results of experiments of this kind are technically classed under the head of *Successive Contrast*, because one naturally passes from one colour to another contrasting colour in succession.

Thus, when a child uses one colour alone, say B, that sensation is constantly relieved, for fixed vision is quite opposed to natural habits, and especially children's habits. In the very act of moving the gaze from the B, the inexorable law of successive contrast causes the eye to voluntarily pick out the complementary in preference to any other, and serves to strengthen the original hue when next looked upon. The negative image, in this case Y, is always present, and exercises a subtle influence upon the work in hand as surely as the force of gravity influences his movements in the playground. (See Chap. VIII.)

Arrange as shown (Diag. 4), so that the

three Primaries R, G, B, have their Complementaries or Secondaries BG, VR (Purple), and Y respectively, directly opposite. Gradually extend the plan to all the six pronounced coloured Normals (Diag. 5), which are in the order: R with BG, O with GB (Cyan Blue), Y with B, GY with V, and G with VR (Purple). W and X may be considered complementary.

When successive strips of the colours of the spectral band as given in Diag. 1 are arranged fanwise in their due proportions as in the prismatic spectrum, and the ends of the band joined as in Diags. 7 and 12 (Diags. 5 and 4 are simplifications), an arrangement known as a Colour Circle or Chromatic Circle is obtained, a convenient device of incalculable value for the study of the varieties, relations, and peculiarities of colours; in short, the Harmony and Contrast of Colour.

In Diag. 12, too, the complementaries are directly opposite, and in addition to those already mentioned gives OY and Turquoise, G-ish Y and VB, Y-ish G and Purplish V, Emerald G and Reddish P, Bluish G and Crimson.

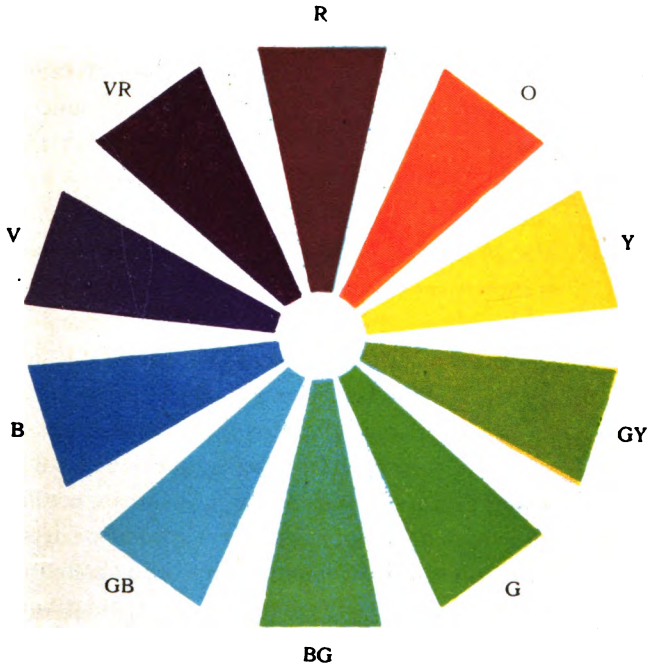

DIAGRAM 5

THE SIX COLOURED NORMALS AND THEIR COMPLEMENTARIES

An accurate knowledge of true complementaries lies at the very root of all efficient colour-training. It is the key to the whole position, at one and the same time the *sine qua non* and the *vade mecum* of the colour-user. To none is it more necessary than to infant teachers, the reasons being obvious when we say that the use of complementaries is the only association in which colours not only remain themselves, but mutually tend to purify each other and develop each other's peculiarities and characteristics to the highest degree, and thus influence the mind most with certain ideas of impressiveness and magnificence which are often intended to be conveyed to and by adults through such words as strength, intensity, richness, fulness, power. This remarkable fact has caused the whole series of colours to be divided into two broad classes by a line drawn across the adjusted Colour Circle (Diag. 12) immediately under GY and Purple V. The colours in the top right-hand half containing all the Reds and Yellows are termed "warm", and the rest "cold". Reds too, and to some extent Yellows, are regarded as exciting, advancing,

exhilarating, luminous; and the Blues and Greens as quiet, retiring, soothing, sombre.

It will be noticed that those complementaries which are farthest from this dividing line offer the greatest contrast, not only in colour, but in warmth and coldness. The clearest and brightest are opposite the deepest and dullest. Hence, for a double reason these should be the very first pairs to associate for children's use, gradually approaching those complementaries situated nearer to or on the dividing line, as O with G-ish B, OY with Turquoise, R with BG, Y with B, Crimson with B-ish G, G-ish Y with VB, R-ish P with Emerald G, GY with V, &c.

Why certain hues or combinations attract and others repel cannot be explained with certainty. The reason differs with the individual, as it ought to do, and may depend upon influences of imitation, tradition, environment, inherited tendencies, more or less delicate natural sensibility to colour, habit of associating certain colours with certain exterior circumstances, the calorific effect upon the mind of various hues, but above all, training, culture, and the standard of general edu-

cation attained (see Chap. XI). Intellectual development is the primitive, essential, and fundamental factor. But of this there is no doubt, that in every satisfactory colour arrangement *one of the hues must be in excess of the other or others, and that a warm one.*

Note.—Pupils should freely use colours before they begin to analyse their nature and relations. Infants should certainly not be bothered with much drill in colours, although carefully trained in colour discrimination. To infant teachers the additional lists of strongly contrasting pairs (Chap. VIII, p. 52) will be particularly useful and welcome.

CHAPTER VI

THE SECOND STEP IN MIXING COLOURS

In general, the previously-mentioned, deeply-saturated hues can seldom be used in complementary pairs for others than young children. In an adult sense they are bad taste, being conspicuous rather than beautiful. They wound the susceptibilities of sensitive eyes and minds

by their violent and startling contrasts. Their very potency and excessive force, which makes them so simple and valuable to the child, is apt to make them unpleasantly garish and unbecomingly obtrusive to adults, anything but what is implied by the word "harmony", though the pair GY with V is an exception, being always excellent. These complementaries must therefore be tempered in some way; and the use of such modified complementaries is often far preferable and always infinitely safer than those in which the strength and contrast are at the very highest available point.

Here, then, is the point at which W and X are called upon to assume their rôle in colour production, *i.e.* as the strength-subduers. Their effects will first be noted when mixed with the six positive normals.

Take any normal, say O. Cover a patch with it. Now mix a little W with the remaining O, and cover a patch on the right of the normal O with the mixture. (Diag. 6.) Again more W with the mixture, and again arrange a third patch on the right of the second. We have now two light tones or

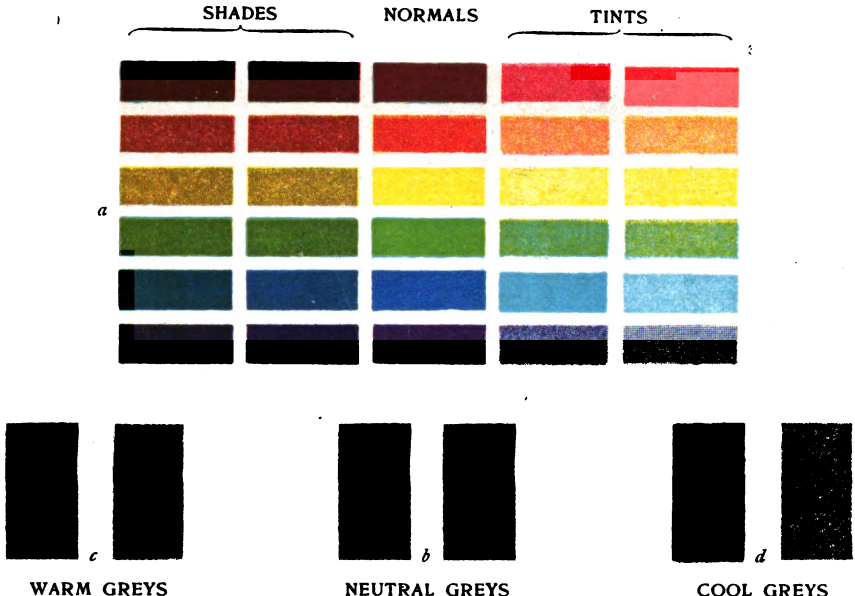

DIAGRAM 6. TINTS, SHADES, GREYS

tints of O. Next mix a small amount of X with normal O, and cover a patch with this mixture on the left of the previously-placed pure O. Again more X in the paint, and again arrange on the left. Now we have two dark tones or *shades* of O. The five successive tones of O considered together may be called a *scale* of that hue.

Each of the six chief hues may be treated in this way, the normal always being in excess of the W or X; the tones formed by reducing the power of the normal with progressive increments of W all being tints, and those by progressive increments of X all being shades. There are thus as many scales as hues.

(The word "shade" has taken the place of "tone", having been applied indiscriminately by dressmakers and others to any modification of a hue, whether tint or shade. Its use should be limited as above—its true meaning.)

Very bright sunlight, *i.e.* a high degree of illumination, has the effect of diminishing the glaring and startling effect of the full normal colour by reducing it to a tint, hence the use of strong hues in Eastern countries. They

melt into their surroundings. A poor light, *i.e.* a low degree of illumination, would cause them to appear as shades.

If W and X alone be mixed in any proportion we obtain *Neutral Greys*, *i.e.* greys free from colour. Neutral greys may be made "warm greys" by a touch of a warm colour, as R or Y, or into "cool greys" by a touch of B. (Diag. 6.) *b* neutral, *c* warm, *d* cool.

Diag. 7 is a repetition of 6*a* arranged as a Chromatic Circle, which, as has already been said, when properly adjusted offers readier and greater opportunities to the colour assorter. A gives the strong and pronounced hues, B the tints, and C the shades. (The various hues have not their relative distance here. Consequently the complementaries are not opposite.)

CHAPTER VII

THE THIRD STEP IN MIXING COLOURS

The mixing of W or X is not the only way of modifying the aspect of any pair of boldly-contrasting colours, and of bringing them into a more mellow relationship

a

PURE NORMALS
AND INTERMEDIATES

b. TINTS

c. SHADES

DIAGRAM 7

NORMALS AND INTERMEDIATES
WITH TINTS AND SHADES OF SAME

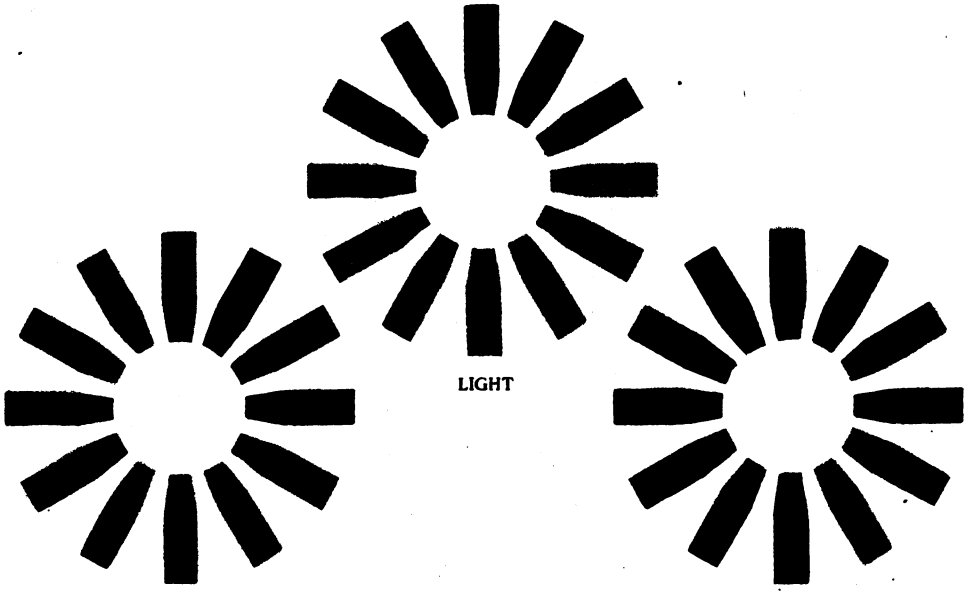

DIAGRAM 8 BROKEN COLOURS

In addition to tints and shades of a pure hue, such a hue may be "broken" by an addition of W *and* X, *i.e.* Neutral Grey, in various proportions, thus again changing a gaudy pair into a quieter and more refined arrangement. Any colour in fact, which will, it is feared, present a harsh and unpleasant appearance if introduced as part of a combination, may be brought more into harmony and keeping with the scheme by thus lowering but not entirely destroying its hue with W or X or Grey. (Diag. 8.)

The "Parisian Art Shades" of the milliner, and the beautiful "mode" colours of the dressmaker, are all broken or dulled colours, as also are the larger portion of all the colours in nature and those used in painting and decoration. They include the so-called Tertiary colours of the R-Y-B theorist. They are simply coloured greys, for the addition of W, X, or Grey very quickly diminishes the power of a hue, and very soon the line is passed where, taking the case of R, it may still be called by that name, and it becomes a grey, *i.e.* a red grey or russet. So also citrine is a yellow grey and olive a blue grey.

What countless legions of colours then may be produced, defying any attempt to accurately name them all! The difference may be so slight that russet may be quite correctly described as an orange grey, citrine an olive yellow, and olive a green grey.

And now the widely-known, well-established, old-fashioned colour names of the draper, dyer, and dressmaker, as scarlet, buff, drab, pink, and the fashionable "art shades" —those new names for old hues, as zircon (green), lychee (brown), wistaria (purple), mist (blue), elephant (grey), which the Parisian modiste is constantly adding to the colour-vocabulary just as primitive man did centuries ago, where we see a term of extreme concreteness gradually gliding into its adjectival sense, and which are at least helpful in choosing a tone when a dainty distinction exists between colours of the same class—may be introduced side by side with the more familiar normal name. For example, giving the broken colours as they appear in their order of sequence on the circle:[1]

[1] Church.

a.	Broken	R	= Maroon.
	„	O	= Russet.
	„	OY	= Brown.
b.	„	Y	= Citrine.
c.	„	YG	= Olive.
d.	„	G	= Sage.
a.	„	BG	= Bluish sage.
b.	„	B	= Slate.
c.	„	V	= Lavender.
d.	„	VR(P)	= Plum.

or putting it another way—

Red	grey	is	Russet.
O	„	„	Buff.
Y	„	„	Citrine.
G	„	„	Sage.
B	„	„	Slate.
Purple	„	„	Plum.

Complementaries have here prefixed the same initial letter. The complementary of russet is a rather bluish sage, and of brown a very bluish sage.

When complementaries are lightened, darkened, or broken, they are still complementaries. The only condition required is that they produce a neutral grey when viewed

together. This may be tested by rapidly rotating a disc painted with alternate sectors of the supposed complementaries, when the colours mingle on the retina as a white of low luminosity, *i.e.* grey, but still a grey quite free from colour. The "Colour Top" or "Maxwell's discs" is a piece of apparatus specially arranged for this purpose by the scientist whose name it bears, though Newton had suggested it.

Tints, shades, and broken colours are by far the safest to use, and are regarded as the most successful arrangements of opposite pairs. Their being diluted or weakened prevents much possibility of harshness, and the fact of their being complementaries ensures that they will not damage each other by harmful contrast. As a rule, the nearer one's colours approach to X or Grey the more freely may one employ complementaries. Even the most objectionable of them, if reduced, may be used with impunity without a jarring effect.

CHAPTER VIII

THE SECOND KIND OF ASSOCIATIONS

Hitherto we have confined our attention to the association of pairs of colours complementary to each other, that is, those lying at the greatest possible distance from each other on the Chromatic Circle, whether full and pronounced normals, or tints, or shades, or broken colours.

We have seen that in such combinations each hue has intensified and strengthened the qualities of its fellow to the greatest possible extent, and that such contrasting effects may be too strong and crude, at least to those people with a more finely developed colour-appreciation.

In addition, we have learned that when any colours are associated, they simultaneously influence each other for better, for worse; for richer, for poorer; to a greater or less degree.

But it must not be supposed that colours exhibit the richest effect and highest beauty

only when complementary. Non-complementary hues may be associated and made thereby more beautifully harmonious, more delicious and precious. In fact, there is no doubt that occasions present themselves when every hue and modification of a hue has the opportunity of proving that it would not only be beneficial in a combination, but the *most* beautiful and valuable factor therein, that its presence would conduce to a resultant richness to a degree which no other colour could. Though it may not virtually be rich alone, though it may lack saturation and depth and possess a washy or dull appearance, the fit companionship is proved by the complete affiliation gaining and improving in lustre, elegance, delicacy, and beauty of toning. An effect may be loud, but still harmonious. Even the ofttimes obtrusive normals are on occasion called into requisition, sparingly it may be, among tints, shades, and broken colours, especially when a piece of work is in danger of appearing poor and uninteresting, and requires enlivening and brightening up. The eye is particularly well pleased with such a simple device.

But to get at the root of the matter.

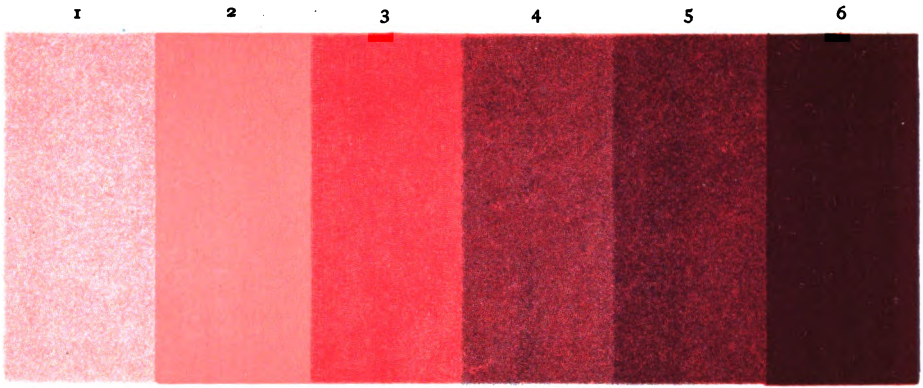

DIAGRAM 9. SIMULTANEOUS TONE CONTRAST

Colours placed in close proximity simultaneously influence each other (hence the technical term—"Simultaneous Contrast") in two different ways.

Firstly, one always makes its neighbour *lighter or darker in tone*, and this entirely apart from its hue or colour as red, green, or whatever it may be. To illustrate: Take (Diag. 9) six perfectly flat and uniform surfaces graduated in strength of tone from light to dark by means of, say, stump and black chalk, so commonly used in art classes for light-and-shade purposes. When these six are placed together in the order named, it is found that No. 2 is darkened on the edge near No. 1 and lightened on the edge near No. 3; while No. 3 is simultaneously darkened on the edge in contact with No. 2 and lightened on the edge close to No. 4; and so on throughout the series. Each has so considerably modified and been modified by its neighbour, that the whole has the appearance of a portion of a channelled or fluted column for supporting the entablature of a building. This effect is known as simultaneous *tone* contrast.

A light colour, then, is made still lighter by being placed near to or surrounded by a darker one, and the darker one is made still darker.

Again, there is always a change of *hue* when non-complementary colours are brought together, and in this connection a knowledge of the true complementaries enables one to anticipate in which direction the modification will be. To again illustrate: Cover a sheet of paper a medium Neutral Grey, and from it cut six pieces of equal size. Place one of these upon each of the six positive normals of larger area as in Diag. 10. The greys no longer appear identical pieces. Each is, in fact, tinged with the complementary of the colour on which it is placed. The grey on the Y, for example, having B as its complementary, has a somewhat blue or darker cast. This effect is seen most strongly in the case of cold grounds, especially if a piece of thin white tissue-paper be placed over the whole. There is thus contrast of hue or colour, *i.e.* simultaneous *chromatic* contrast.

In these two latter experiments (Diags. 9 and 10), we noted the behaviour respectively of two non-colours (neutral greys or passive colours)

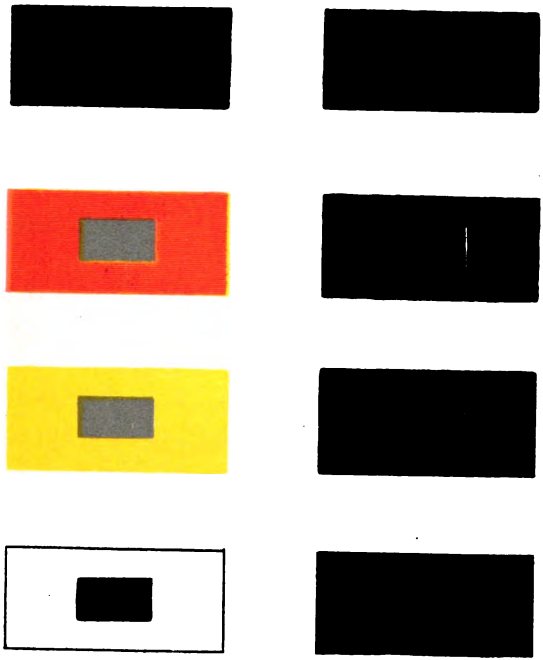

DIAGRAM 10

SIMULTANEOUS CHROMATIC CONTRAST

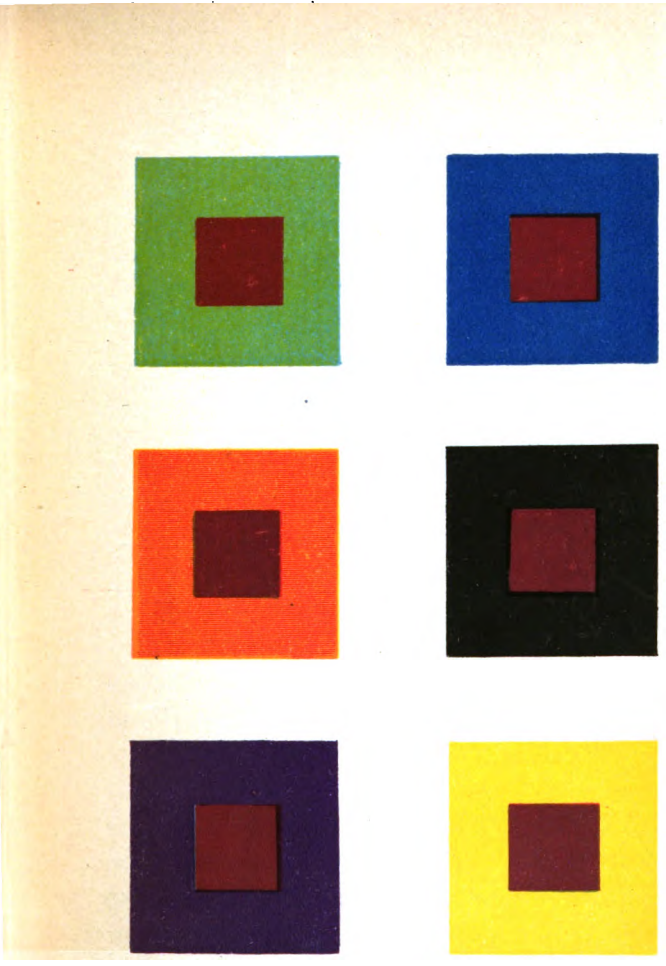

DIAGRAM II

SIMULTANEOUS CONTRAST OF TONE AND HUE

together, and a non-colour with colour (active colours). Now we proceed to notice two non-complementary colours when affiliated, and equipped with the information already acquired it is but natural to anticipate that there will be a change in two directions, viz. contrast of tone and contrast of hue; that each will impinge upon the other's individuality to such an extent that the pair will become more different than before in every way. And on testing our conjecture by reference to Diag. 11, where R is associated with BG, B, O, X, V, and Y, this we find to be actually the case. As BG is the complementary of R, no change whatever is possible. The R is in its purest and most deeply-saturated state. It appears simply what it is and nothing more. But in the second case, as it is placed on a darker colour than itself, the R no longer vaunts forth its qualities unmolested, but is lighter, and moreover, assumes a scarlet or orange hue from the Y complementary of the B ground, and particularly so round its edges,—"Colour Irradiation". On the O the R is darker still, and is tinged with the GB complementary of O, while on X it is the clearest and brightest,

as if it were lightened with W. Also R on V approaches an OR tone, while on the luminous Y it is darkest of all and inclines to purple. "The results" of the experiments in simultaneous contrast "confirm in every particular the Red-green-blue theory, and can neither be predicted nor explained on the Red-yellow-blue theory."[1] Thus by this indispensable Key of Complementaries a colour-scheme in its effect may be regulated in any direction and to any extent. It is absolutely and entirely under one's control.

Applying these facts to an examination of pairs as to their position on the Chromatic Circle (Diag. 12), we find that when the distance is as great as possible, viz. 180°, there is no change whatever in hue, but when the interval is small the change is great, *i.e.* the greater the contrast, and particularly so if they be far from the great dividing line (p. 35); the nearer alike the greater the risk of their injuring each other. Examples of the former are known under "Contrasted Harmony". When two non-complementary colours are brought into contact, the effect is to ap-

[1] Church.

parently move them farther apart on the circle. Consequently if a colour be arranged with another chosen from just a little on one side of its own complementary, *i.e.* one, say, 30° more or less than 180° away, the association is more agreeable and not so difficult of management as the complementary assortment. The amount of contrast is not quite so excessive, and therefore not so trying and hard. These, then, may form the first experiences after the use of the directly opposite pairs, as hitherto advocated. Thus P with G-ish Y, VB with OY, OR with turquoise, R with B, Y with V or P are better than the first-named in each pair with its complementary. Indeed, they may be advantageously employed as favourites before the introduction to pupils of the diluted or weakened hues. They would form a large selection of emphatic and striking pairs for free use before it is desirable to commence the more theoretical study of the relations and composition of colours. The capacity and progress of the child will decide that. (See note, end of Chap. V.)

The very best combinations in pairs preserving a due amount of contrast are situated

at a distance of about 80° or 90° apart. Those separated by a less interval are in danger of proving dull and poor companions, while those by a greater are apt to jar by the crude and harsh appearance which a too near approach to the complementaries is sure to introduce.

The following is a list[1] of decided non-complementary pairs and their general appearance:

1. Excellent.

R and B
OR „ B
OY „ V
OY „ VB
Y „ V

2. Good.

OR and GB
OR „ V
RO „ GB
RO „ B
O „ V
O „ G
O „ GB
O and BG
OY „ P
OY „ B
OY „ GB
Y „ P
GY „ P
YG „ B
BG „ V
BG „ OR
BG „ RO

3. Good, but strong and hard.

R and G
R „ BG

[1] Selected from Church and Ward.

O	and	B	**4. Fair.**		
GY	„	OR	R	and	GY
YG	„	R	OR	„	P
G	„	V	OR	„	YG
G	„	RV	RO	„	YG
BG	„	V	RO	„	Y
BG	„	P	OY	„	BG
BG	„	R	Y	„	GB
BG	„	O	GY	„	OR

There are times, of course, when nearly-related colours are mated, *i.e.* those separated by but little distance in the prismatic band. Most of the colours of natural objects—the coverings of animals, as shells, birds' plumage, and fur; the graduated colours of flowers and masses of foliage—are of this kind, and are classed under "Analogous Harmony". Often, too, two or more tones of a single hue, say B, entirely compose a scheme, *i.e.* "Dominant Harmony", with good effect, there being always *some* contrast in any collocation, delicate in analogous hues, bold in widely separated ones.

Many more or less elaborate, and more or less satisfactory systems of classification

of these colour harmonies have been made, and no hard-and-fast lines have separated the kinds thus named. The task of exact classification has been rendered difficult and well-nigh impossible by the almost imperceptible passing of one set of colours into another, thus necessitating the use of the relative terms already given, viz. Contrasted,[1] Analogous, Dominant. The following table, however, is offered as a means of broad or detailed classification according as the analysis of a scheme is less or more minute:—

[1] It is difficult to see why "Harmony *and Contrast* of Colours" should be so frequently met with.

TABLE
OF
COLOUR HARMONIES

Monochromatic or Dominant
i.e. two or more tones of one colour, *e.g.*
(1) light blue with dark blue,
(2) OY with OY shade.[1]

Polychromatic or Diverse
i.e. two or more tones of distinct colours, *e.g.*
(1) Y with B, (2) O with G.

Analogous
i.e. small interval on Chromatic Circle, *e.g.*
(1) greens with blues,
(2) yellows with greens.[2]

Contrasted
i.e. wide difference on Chromatic Circle, *e.g.*
(1) greens with reds,[3]
(2) yellows with purples.

Complementary

Non-complementary

[1] Diag. 13. [2] Diag. 14. [3] Diags. 15 and 16.

CHAPTER IX

EFFECTS OF BLACK, WHITE, AND NEUTRAL GREY

1. As Ground Surfaces.

Place six strong colours on X, W, and Neutral Grey, allowing a considerable margin of background in each so that it may, by sheer area, overwhelm any colour placed upon it. (Diag. 17.) Here again a knowledge of the complementaries is of the greatest value.

Black seems to tinge all colours upon it with its complementary W, thus making them much brighter, more distinct and brilliant by contrast, especially if they be light colours. They seem more deeply saturated (but not quite so pure, the white complementary giving them a slightly milky or washy appearance).

All colours on a *white* ground are deeper, purer, and more emphatic in hue, especially if deep and full, as blues and purples. The tone is heightened, hence the value of patterns on W paper. The paper itself, acquiring a tinge of their complementaries, causes the difference

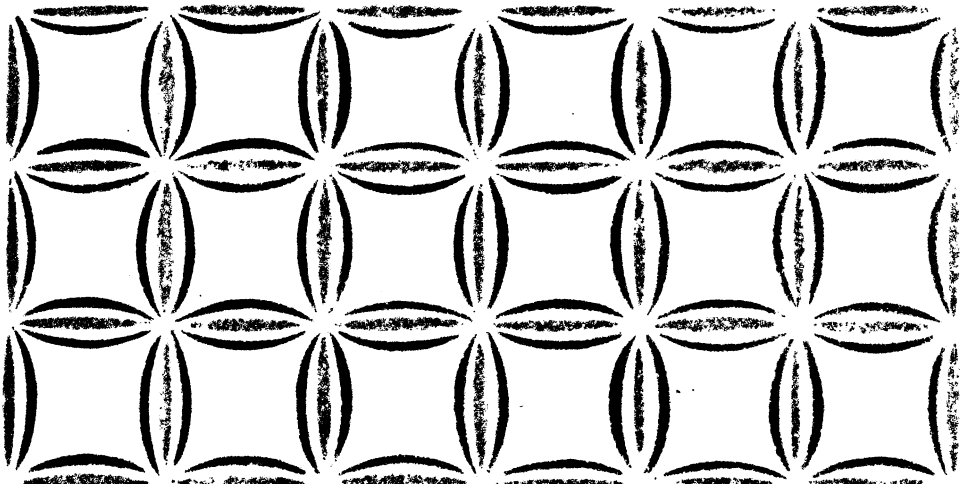

DIAGRAM 13. DOMINANT HARMONY

DIAGRAM 14. DIVERSE ANALOGOUS HARMONY

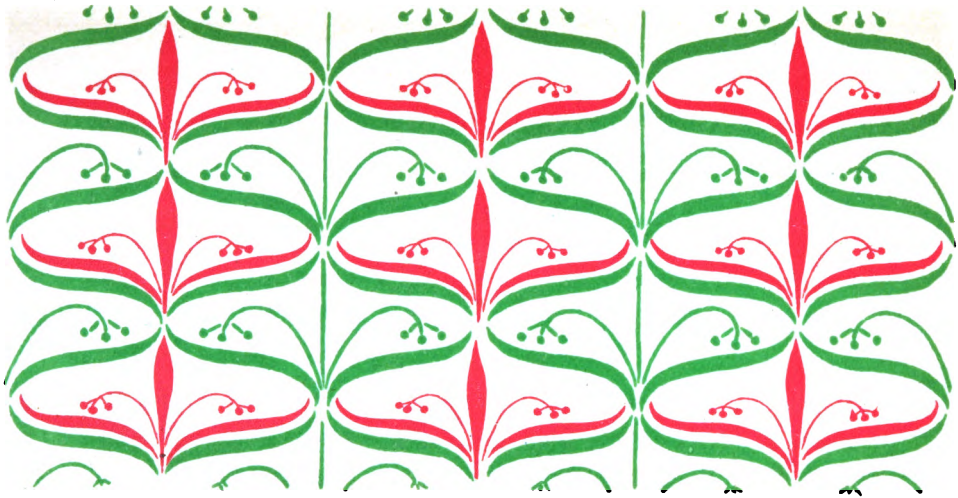

DIAGRAM 15. DIVERSE CONTRASTED HARMONY

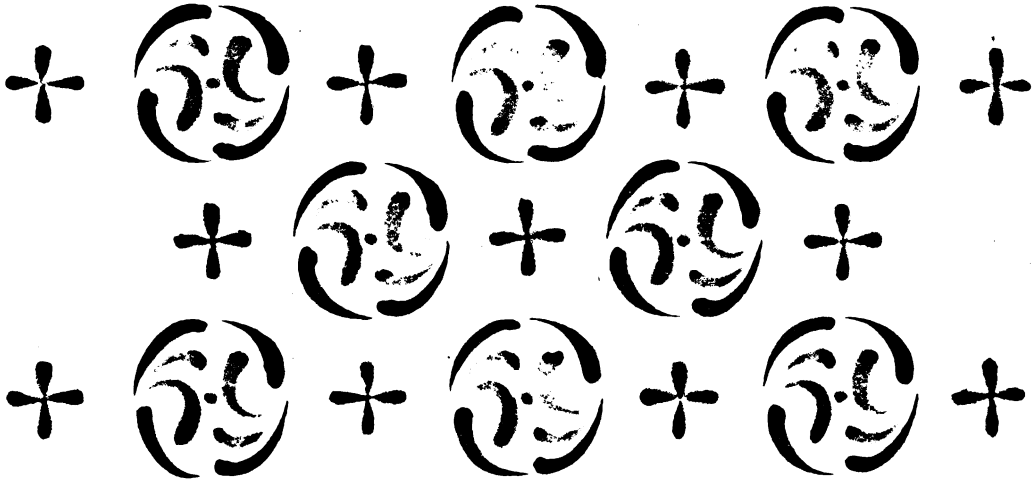

DIAGRAM 16. DIVERSE CONTRASTED HARMONY

to appear more pronounced and distinct. Thus, if R be on W, the W becomes tinctured with the complementary of R, and the latter appears deeper, brighter, and stronger.

The effect of a *neutral grey* ground, it will be anticipated, depends upon the relations between the tone of the grey and the tone of the colour upon it. Its effect will vary according to its depth. A very dark grey will act more like X, while a very pale grey will act more like W. If a grey be darkened, the colour is proportionately brightened. Grey generally lessens the apparent saturation but increases the brightness.

To sum up then: All colours on W appear their darkest, on X their lightest, and on Grey the normal would in most cases be better maintained than on X. Bright colours on a dark ground increase in brightness and luminosity, but if applied to light grounds are impoverished; intense colours gain in depth and saturation on light surfaces, but suffer in these qualities on dark ones. A dark, dull tone on W would appear still duller, but on X would gain in brightness and saturation.

2. As Bordering or Separating lines.

The effects are now generally more complicated by the changes brought about upon the X, W, and Grey, for their small area prevents them having the power they possessed in the previous case, and, as may be expected, they become themselves tinctured with the complementary of the colour with which they are affiliated. Thus *black* used as a separating line between two sombre colours, as deep B and V, would be of little use. All three are so nearly equal in brightness, that X does little or nothing to emphasize them, and is itself injured by acquiring a rusty hue from the yellow complementaries. *White* between these two would be very strong indeed, while *grey* would be better than either, being less violent than W and more powerful than X—the happy medium.

Black, though sometimes perhaps strong, never produces a bad effect between two, or edging, luminous colours as R and O. These, as will be seen, are too near on the Chromatic Circle to look well together, but with a line of X between, a harmonious effect

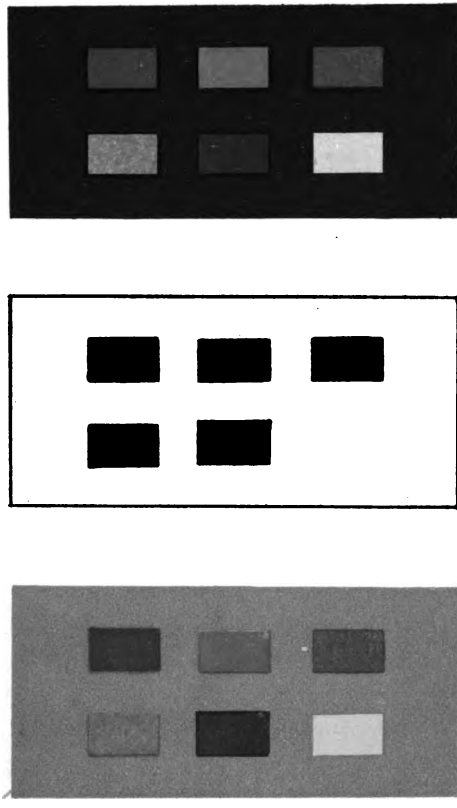

DIAGRAM 17

EFFECTS OF BLACK, WHITE, AND NEUTRAL GREY

is produced. Grey here would not be quite so good as X, nor W so good as grey, though as a general rule W might safely be inserted between two colours that do not harmonize well. It seems to increase the saturation of both thus separated. X will not tend to harmonize a luminous with a sombre colour, as R and V, R and B, O and V, O and B, Y and B. White is superior here.

CHAPTER X

A PRACTICAL GUIDE TO MIXING COLOURS

It has already been said (Chap. IV) that when colours are mixed a certain dinginess or fogginess results, owing to the grey which is always formed by such mixture. And in order to reduce to a minimum the chances of producing this poorness of hue, one principle has herein obtained from the pupil's very first introduction to colour-mixing, and this might be emphasized here, viz. the nearer the colours proposed to be employed in a mixture approach the hue one is seeking to obtain,

the brighter, clearer, and more successful will the result be—a natural expectation. The farther from one another the colours are situated, or the greater the number of hues mixed, the greater the chances of obtaining mud. For example, if a bright purple be required, the R must incline to P rather than O, and the B to V rather than G. Gamboge and Prussian Blue produce an intense and pure G when mixed, on account of the amount of G in each. Designers, lithographers, and illuminators avoid the dirty tones often produced by mixture by placing very close together the alternate colours in dots or dashes. These then blend upon the retina in one bright whole of extreme purity of tone.

The following suggestions are offered for producing mixed tones. It must be remembered, however, that the same tone may be produced in various ways, according to the range and constitution of the palette, *e.g.* olives may be obtained from Y with X, or from B or G with Neutral Grey; browns from reds or oranges with X; russets from R with Neutral Grey, or Carmine with Indian Red,

and so on. Considerable diversity of tone, too, may be obtained according to the amount of the several elements comprising it, and two similarly-named colours from two different manufacturers may be quite different in hue.

REDS

Scarlet—R and Y.
Crimson—R and little B.
Rich, glowing crimson—Crimson Lake.
Maroon—R and Neutral Grey.
Chocolate—R and X; Vandyke Brown and Carmine.
Deep opaque R—Vermilion.
Transparent pink—Rose Madder.
Opaque pink—W and little Vermilion, or W and little Rose Madder.
Warm brown—Burnt Sienna, X, and Aureolin.
Cool brown—Burnt Sienna, X, and Cobalt.
Cerise is pink red.
All carmines border on P.

ORANGES

Clear and pure—Deep Cadmium Y of full O hue.
Rich and warm—Cadmium Y with Carmine.

Vivid and transparent RO—Carmine over a ground of Gamboge.
Various—Aureolin or Y with Rose Madder.
Buff, salmon, gold—O and W.

YELLOWS

Vivid—Lemon Y; Lemon Y with W; Gamboge with W.
Pure and transparent—Gamboge.
Rich warm-toned—Cadmium Y.
Clear transparent—Lemon Y with Cadmium Y; Lemon Y with Gamboge.
Fine brownish—Cadmium Y with little P.
Drabs and citrines—Y with Neutral Grey.
Primrose, straw, lemon—Y with X.
Olives—Y with X.

GREENS

An immense variety of greens from the most brilliant to the most sombre—myrtle G, sea G, grass G, apple G, emerald G, moss G—may be obtained from Y with B according to the proportion of the elements in the composition, or by mixing Aureolin, Yellow Ochre, or Burnt Sienna, with Cobalt.

Strong G — Gamboge and Prussian blue; Emerald G and Lemon Y.

Bright G—Lemon Y and little Cobalt.

Vivid transparent G—Gamboge and little Cobalt; Cadmium Y and Cobalt; Gamboge and Ultramarine (French blue); Cadmium Y and Ultramarine.

To lower any of these in tone add a touch of Crimson Lake.

Pea green—Green and W.

Emerald green contains traces of W and B.

Sea green or Aquamarine is a bluish green, as is also Turquoise.

BLUES

Bright azure—Cobalt; Cobalt and W

Very strong—French Ultramarine.

Deep pale—Ultramarine and W.

Smalt is purple blue.

Indigo—B and X.

Pale blues, peacock blues, lavenders, slate blues—B and W.

Genuine Ultramarine from lapis lazuli is the purest blue known, but the price prohibits its daily use. French Blue or arti-

ficial ultramarine inclines to V. Cobalt blue, Prussian blue, Indigo, and Ceruleum all reflect green.

PURPLES

FROM REDS AND BLUES

Rich cold purples, *i.e.* Lavender, Heliotrope, Lilac, &c.—Cobalt and little Rose Madder; Cobalt and Crimson Lake; French Blue and Crimson Lake; French Blue, W, and little Rose Madder.

Rich warm purples, *i.e.* Puce, Maroon, &c.—French Blue and Carmine; Rose Madder and little French Blue; Rose Madder and little Cobalt.

No one pigment represents Purple, but Mauve and Magenta make a fair representative. Puce is a dull purple or pink blue, Lilac may be a tint of purple, and Lavender a broken violet.

Cobalt and Rose Madder
Fine blue with Crimson Lake or Madder } = a violet.

GREYS

Neutral—X and W.
Warm—X, W, and a warm colour, as R or Y.
Cool—X, W, and a cool colour, as B or G.
Pearl—X, W, and Cobalt.
Slate—X, W, and little Crimson Lake.
Silvery—X, W, Cobalt, and Rose Madder.

Very small quantities indeed of W are recognized by the eye in producing tints of hues. Moreover, it will be found that if larger quantities be added they cause the mixture to assume a bluish cast. This is why X and W in black chalk were suggested for Diag. 9 to show gradation of tone, perfect gradation being impossible in any one colour owing to this alteration of hue. It will be found, too, that when the purest W is mixed with the purest X—both free from the slightest tinge of colour—the result is a somewhat bluish grey. This coldness may be counteracted by a touch of a warm colour.

CHAPTER XI

THE INDIVIDUALITY OF THE COLOURIST

Fortunately, opinions differ as to the comparative amounts of the various colours required in a piece of work—upon the question of Chromatic Equivalents, that is.

Rules have been laid down by red-yellow-blue advocates that (1) in any composition all the chief hues must be present either singly or in combination so as to excite all the colour sensations; (2) these must be present in certain quantities that one may not override another in effect. One writer gives "a diagram so arranged as to present at one view the exact surface quantities in which colours harmonize with each other"; "the relative quantity of each hue which should be present in any ornamental arrangement"; that "5 red + 3 yellow + 8 blue in material colours when mixed are neutralized or destroyed".

Here, then, in this simple yet wonderful

formula is contained the secret of the whole art of colouring, the aim being to always neutralize or destroy colour "to satisfy the eye and produce harmony"! Says Church of it: "Put to the test the assertion is completely falsified, for neither in these nor in any similar proportions can these three colours be made to yield a neutral grey when mingled on the retina", and it may be easily demonstrated that a mixture of the three named, a so-called "tertiary" hue, cannot produce a colour effect (*i.e.* a colour sensation) of more than two of the constituents. "All art reveals open secrets", but the art of colouring is not quite so mechanical as that. If harmony consists in producing commonplace monotony, or at best a mediocre, average result, then the dictum is the be-all and end-all of colour-sense training. The last word has been said.

Then why employ at all those skilled tacticians—educators and teachers—who seek at every opportunity to foster, nourish, and develop the innate germ? What use in experiment with the various hues; or observation of the effect of their collocation (and "obser-

vation means something more than merely seeing a thing")[1]; or of the training and knowledge thus acquired and classification made of tints, shades, and broken colours; of complementaries; of the subtle influence of the ever-present negative image; &c. &c? Why educe the various mental effects as warm or cold, exciting or soothing? Why, above all, endeavour to cultivate taste, individual fancy, independent judgment of the quality of colour?

The formula rebels against the very spirit of education, and savours of a time when codes encouraged to drill at a child simply as a crowd unit rather than to train him with a view to his pursuing an individual career. It would almost supersede thought, would limit effort, prevent exertion, and exclude personality entirely. It would tend to crush initiative, cripple originality, kill inventiveness, and result in a common dead level of "propriety". Artists (and the term has a wider significance than is commonly supposed) would shortly become an extinct species did they recognize its existence, for

[1] "Suggestions."

these of all creatures are they who have dared to preserve and develop from infancy a portion at least of that complete and independent personality with which all are equipped. "Will", "appetite", is the groundwork of every individual. An artist does not follow the throng. Crowd influence is nothing to him, except, alas! when he is compelled by his master-manufacturer to gratify the wishes of a fickle, crowd-led, and perverse public.

The adoption of the formula would, in a word, stifle "the highest possibilities of the individual", and prevent a free and full development of "self" in thought, and therefore in action, which is "the true end of true education".

Furthermore, judged by their works, the great colourists of the past have at least ignored the canon. Their aim was to produce good colour, not neutralization of colour—a sum equal to a dull, dingy, forbidding, colourless grey.

Neither does the law indicate the way of Nature, who spends half her kingdom in presenting vast masses of soothing green. "All artists are the children and servants of

Nature, looking to her as the one source of inspiration."

No doubt the formula serves to secure a balance of colours in an optical sense, but this differs from the æsthetic balance. The truth is, that beauty is a very complex idea depending upon many complicated considerations. There are what may be termed more human or sentimental forces at work which quite overrule and even reverse those lower optical and physiological laws. Appreciation of beauty in the arts — poetry, music, and the like—is emotional rather than intellectual. There is an inner meaning and worth. The sense organs, whether special or diffused, convey the immediate *sensations* of colour, sound, warmth, hunger, fear, and indirectly produce upon the mind *emotions* of gladness, anger, despair, excitement. But the birth of these latter ideal feelings necessitates an operation of the intellect, an exercise of the judgment. Consequently the more nurtured the eye, coupled with the higher development of the faculties, that is, the more acute the discriminative power between fine tones of colour accompanied by the higher

elevation of the intellect, the more fastidious one becomes in choosing, arranging, and appreciating pleasant accessories, the higher is the form of beauty, and the greater and deeper is the pleasure derived.

Except in infancy, colours, as other sensations, are never taken exactly for what they are worth in themselves, though they may unassisted produce a sensory pleasure. A cultured person spontaneously looks beneath and beyond them, associating and comparing, interpreting and deciphering, recognizing some resemblance, analogy, or suggestion, and is affected according to the estimate thus formed. Some spot in his social condition is touched. The evolution of ideas rules that of feelings. This differential estimate in individuals is what we call "taste". An infant's organs are as yet comparatively undeveloped. It has few experiences to draw upon, few materials for association. Its intellect is practically at zero, and therefore its emotions also.

On the other hand, an educated mind has the accumulated results of a past life at disposal, and his æsthetic appreciation may

confidently be expected to have increased as his wealth of knowledge has augmented, for "progress in æsthetics consists largely in the constantly increasing appreciation of more and more delicate forms of pleasure, coupled with the constantly increasing sensitiveness to more and more delicate shades of discord and unpleasantness".[1]

Ideas and codes of beauty, then, differ with each individual. Taste "is personal and restricted rather than universal and general". Colour harmonies are not to be procured from a strict adherence to a given set of proportions; for an artist, being what he is, the dogmatic laying down of rigid rules would be ridiculous in the extreme and altogether useless. The affair must be left to his judgment and delight. He relies on his own self-effort; guides, controls, and tries to realize "self". He preserves always the æsthetic balance, his feelings, sympathies, aspirations, thoughts, finding expression in his productions. He sees beautiful analogies, and the greater the skill and measure of success with which his handiwork reveals them for the beholding and

[1] Allen.

enjoyment of his fellows, the more firmly established is its claim as a work of art and his as an artist.

But art work is not merely emotional work; neither, on the other hand, is it wholly calculable. Artists are not mechanics or mathematicians. Their temperaments are diametrically opposed. Yet the successful artist has both science and common-sense sufficient to intelligently appreciate the conditions and restrictions under which he is working. He cannot, for instance, deal with clay as with iron, with glass as with cloth; and the scientist who aspires to the realm of his brother must remember that "knowledge without fine feeling is futile". He must apprehend, experience, and appreciate before he can express; and the ability to express is the surest test of the ability to see. With the artist it is a matter of feeling first plus reason afterwards. That is the difference between artists and scientists.

Now, what does the designer, decorator, or ornamentist in colour desire to do? Well, as we have already said, that depends entirely upon the conditions governing the

particular case in hand, conditions over which he has no control. He is pre-eminently a creature of circumstances after all. He may have a vision of a colour combination which is exquisitely lovely, but which, when applied, or rather misapplied, to the material, may be a hopeless failure. His desire, if he had one previously, cheerfully gives way in favour of the demand, for he is restricted by the properties and exigencies of the subject, which are really "blessings in disguise". They give him the cue and suggest the next step forward.

He regards the material in which the work must be wrought—glass, metal, cloth, or pottery—its qualities and texture. He considers the intended distance from the eye (for on receding the colours will blend), purpose (for the use must be unimpaired), importance (for its position of priority must be maintained), value, size, shape, &c. All are matters which modify his choice of colour and treatment. The amount of this or that hue is not to be prescribed except by his own estimation, neither is the kind. It is a problem to be solved in his own way. He trusts to his

own instinct, his own good taste and sensibility to colour which no rules supersede, (unless it be those inexpressible and unwritable ones,) his own skill and facility. He carefully weighs the conditions, is prompted in a certain direction, seizes the opportunity, follows the lead given, carries what he considers is required, and deals with it as only he would, thereby, unconsciously it may be, placing upon it the hall-mark of his own personality.

He may *now* have a subservient wish to produce some special effect — strong and vigorous, or soft and gentle. In the former he will perhaps employ sharp contrasts, in the latter easy gradations; descending neither to tawdriness, vulgarity, and pomposity in the one case, nor to tameness, weakness, and barrenness in the other. He modifies as he thinks is desirable, emphasizing by an attractive colour the movement of a sinuous flowing line here to enliven even to fussiness, or a horizontal straight line there to quieten and steady. He subdues the over-sharpness of those angular points and cross-lines, maybe, by drawing attention to the more-flowing cur-

vilinear portions, regarding all the while the width of line, area of mass, and pitch of both, the form and proportions of the spaces of the colours to be used. Combinations owe their beauty to something besides mere colour. "All things work together for good" even in a colour-scheme, the arrangement and distribution of the several hues, no less than their selection, ministering to the attractiveness of the complete ensemble. All are parts of a single unit. He remembers the value of the warm and cold colours for enforcing the admirable features, suppressing or amending the indifferent ones, or obliterating the poor ones. He may call to his aid the complementaries or contrasting hues for reviving and stimulating interest in a scheme where he is compelled to work in general with dull, dark, or pale colours, or for producing a strong, or even brilliant, showy, and gorgeous effect.

Now it is regarded as a principle in all the highest art to have some central point of interest in the composition—picture, pattern —whatever it may be. Everything—lines, masses, colour—will be employed to conduce

toward this intelligent purpose, viz. to direct the beholder's eye to certain portions of it. It is, then, of the first importance to determine at the very outset what the leading features are to be. That settled, all is held subservient for gently, perhaps forcibly, but naturally and firmly, emphasizing the special point of the work. And one way of doing this is to have one colour in the scheme, whether dyads (twos), triads (threes), tetrads (fours), or a more complicated combination of colours be employed, more prominent than the rest either in area or intensity, and this (as in Chap. V) a warm colour.

In the best examples of coloured work in pottery, stained glass, mosaics, printed and woven fabrics, and the like, warm colours are nearly always found very much *en évidence*. Those composed almost exclusively of the colder colours are never quite satisfactory.

There is always something unpleasant and bewildering, too, in an undecided scheme. Such an one tortures by its very uncertainty. Neither-this-that-nor-the-other effects in anything are seldom commendable. As well have a poem without a point or a play without

a plot as a colour-scheme without a nucleus, some main point to which everything works up. One colour should distinctly predominate, and an accomplished colourist, while thus imparting a piquancy and character, conveying a definite impression according to the hue emphasized, still succeeds in giving richness and perhaps adding an air of mystery, and thus maintaining pleasurable interest by craftily mingling a sympathetic tone here and another there, *en attendant* the main object.

A pleasure has been described as "the feeling which results when any nervous centre receives a stimulation not excessive in quantity nor beyond the existing power of the structures concerned", and this may explain why the warm colours are more generally admired, the order in which the six normals cause greatest visual fatigue being G, V, B, R, O, Y. The spectral or reversed image in Successive Contrast (Chap. V) is stronger with G than with any other colour. Large clumps of strong G thus irritate sooner than those in any other colour, and the ability to successfully combine vivid greens with other

hues, more especially blues, shows unusual skill. On the other hand, Y, O, R, particularly the latter, when judiciously applied, give cheerfulness, freshness, and brightness, and relieve the monotony of a sombre group; but this may very easily be overdone, for as a rule any very bright hue is offensive when interspersed among much weaker ones. "Softness without melancholy, and brilliance without glare" has been given as an eloquent description of a summer evening; it applies with equal appropriateness to the description of a well-arranged colour-scheme. Proper relief in reasonable amount and just measure of brilliance of effect must be got by slight and pliable contrasts, not by aggressive and gaudy dabs of sharp colour thrown here and there. Spottiness is likely to result. The method of attempting to interest is too plainly apparent. While an observer admires frankness and honesty, he refuses to have this or that thrust upon him. He resents being dragged unceremoniously. He prefers to linger by the way and enjoy the beauties as they gradually unfold themselves. He admires the subtlety of the adroit guide who irresistibly entices

him over the field to the desired spot through the artfully-devised mass of stimulative pungency here, or the cunningly-arranged tract of mild, retiring tones there.

"The final step, it seems to me, is taken when we arrive at the pure love of colour in nature for its own sake, the love that draws the cultivated man to gaze with delight upon the autumn hues, the rainbow, the sunset clouds, or the myriad tints of sea and sky and plain and forest. In works of art so many additional factors of plot interest, of admiration for imitative skill, or of critical appraisement, enter into the total of our consciousness, that we can hardly analyse our feeling into its simple constituents." [1]

CHAPTER XII

FROM SIMPLE TO COMPLEX

1. Colours in Pairs (Dyads)

Simplicity counts for much in art; and it must be remembered that many changes

[1] Allen.

may be rung upon a pair of colours by the quality of material, as the sheen of silk, lustre of enamel, glaze of pottery, which is denied to the worker in matt-surfaced cloth, prosaic paper, or dull iron.

"Tones of orange with broken blues, soft reds with grey greens, lavenders and lilacs with warm yellows, medium violets with yellow greens, are traditional harmonies."[1] The following are—

GOOD DYADS[1]

1. Heliotrope and light amber.
2. Violet and amber.
3. Violet and light yellowish-pink.
4. Ultramarine and dark yellow-green.
5. Grey blue and light golden-ochre.
6. Plum violet and sage green.
7. Plum purple and orange amber.
8. Brownish yellow and deep warm-green.
9. Dull orange and slate blue.
10. Dull indigo and dull orange.
11. Slate blue and greyish yellow-green.
12. Scarlet and buff.
13. Deep blue and yellowish pink.

[1] Ward.

14. Chocolate and pea green.
15. Maroon and warm green.
16. Black and bronze yellow-green.
17. Deep red and medium grey.
18. Venetian red and grey yellow-green.
19. Coral red and turquoise.
20. Chamois and lavender.
21. Deep crimson and yellowish green.
22. Deep golden-yellow and sea green.
23. Golden brown and olive green.
24. Pale turquoise and pale orange.
25. Deep blue and yellowish green.
26. Indigo and light olive-green.

A better effect is produced if these are separated by X, W, or Grey, according to the pair. (See Chap. IX.)

2. Colours in Threes (Triads)

A good pair will most likely be spoiled by the addition of a third hue, but a poor or bad pair will be improved by a third, especially if chosen from a point at a considerable distance from both on the Chromatic Circle. Good triads are situated at or about 120° apart, and two of the colours again should be warm.

Often in a triad contrast is somewhat sacrificed in order to obtain this end; *e.g.* in the triad: purple-red, yellow, and greenish-blue, the R and Y are less than 90° apart, and thus somewhat dangerous, but the presence of the B makes it a good combination, being, as it is, just near enough to R to bear propinquity with it, and quite far enough from Y to contrast with it.

Triads are much easier to arrange than pairs, but of course the number of the former is more limited than the latter.

GOOD TRIADS

List 1. (Ward) *Italian Painters' Favourites*

1. Red, yellow, blue.
2. Coral red, ultramarine, orange amber.
3. Scarlet, olive green, violet.
4. Orange, green, violet.
5. Purple, yellow, grey green.

List 2. (Ward)

1. Red, yellow or gold, blue.
2. Medium red, turquoise, orange yellow.
3. Olive green, dark blue, deep amber.
4. Orange, grey blue, cream.

5. Orange red, dark blue-green, dark yellowish-green.
6. Deep crimson, dark stone-colour, darkened greenish-yellow.
7. Deep crimson, light leather-colour, medium blue.
8. Purple, orange, green blue.
9. Grey blue, amber, greenish blue.
10. Violet, orange yellow, green.
11. Ruby red, deep blue, greenish gold.
12. Scarlet, olive green, violet blue.
13. Purple, yellow, grey green.
14. Lavender, dull orange, yellowish green.
15. Dark venetian-red, deep chamois, sea green.
16. Indigo, orange red, deep greenish-yellow.
17. Leaf green, pale orange, pale pink.
18. Coral red, ultramarine, orange amber.

List 3. (Church)

1. Normal red, yellow, normal blue.
2. Purple red, yellow, greenish blue.
3. Orange, normal green, violet.
4. Orange, normal green, purple violet.
5. Amber, cream, blue (medium strength).
6. Normal red, green, normal blue.
7. Leaf green, puce (deep), rose grey.
8. Leaf green, violet, salmon.
9. Terra cotta, maroon, sage green.

10. Yellow, violet, yellowish green.
11. Normal green, orange, turquoise.
12. Amber, pale blue, crimson.
13. Maroon, bronze yellow, olive green (dark).
14. Apricot, crimson, gold brown.
15. Flesh red, normal blue, olive green (pale).

With triads, as with dyads, a better effect is produced by a suitable separating line of X, W, or Grey.

There is danger in attempting colour-combinations of a more complex nature than triads. Variety brings advantage, but with a multiplication of tones it does not follow that they will be one whit the more attractive. A great diversity of hues, an all-the-colours-of-the-rainbow assortment, gives superfluity and confusion, and is over-gorgeous and vulgar. Breadth of treatment and oneness of appearance must ever be maintained. The secret of success in obtaining this general effect lies in the use of slight variations and repetitions of, or tones "leaning to", the principal colour in the group, varied just to that extent which will impart precision and mark the leading element of the design and preserve its dis-

tinctive character. By this device, by skilful and intelligent grouping and support, too, variety is gained without sacrificing the balance of the system as a whole. The trick is one borrowed from Nature. Here pure tones are not met with except in infinitesimal quantities; transitions are mostly gradual. Observe how one feather in a bird's wing momentarily flashes its gay hue in the sunlight, and the next instant reveals its palpitating opposite; how the pure clean tones of a leek gracefully glide into tender deeper ones from root to tip; how, at one glance, a grain in a piece of coal darts a bright gleam, and at the next echoes its throbbing modification. Says Ruskin somewhere: "No colour harmony is of high order unless involving indescribable tints".

List of Twelve Tetrads (Ward)

1. Red.
   Chamois Y.
   Grey green.
   Bluish green.

2. Blue.
   Red.
   Violet (medium).
   Gold.

3. Crimson.
   Grey green.
   Pink (greyish).
   Straw colour (deep).

4. Maroon.
   Olive green.
   Pale amber.
   Sea green.

5. Blue.
   Gold.
   Blue green.
   Amber (dark).

6. Violet purple.
   Amber red.
   Ultramarine.
   Olive green (dark).

7. Grey (dark).
   Red.
   Sea green.
   Greyish Y.

8. Indigo.
   Citrine Y.
   Grey blue.
   Olive (warm).

9. Pea green.
   Slate blue.
   Venetian red.
   Pale orange (greyish).

10. Lemon gold.
    Turquoise.
    Venetian red.
    Blue green.

11. Orange (pale).
    Blue (dark).
    Turquoise.
    Warm white.

12. Ultramarine.
    Jasper.
    Dull gold.
    Blue green.

List of Four Hexads (Church)

1. Full bluish-green.
   Full blue.
   Medium yellowish-orange.
   Medium purple.
   Pale orange.
   Crimson.

2. Deep blue.
   Dark red.
   Pale green-blue.
   Pale yellow-green.
   Dark blue-green.
   Dark yellowish-olive.

3. Medium crimson.
   Medium yellow-green.
   Salmon.
   Medium yellowish-olive.
   Pale yellow.
   Maroon.

4. Deep blue.
   Maroon.
   Pale blue-green.
   Pale yellow.
   Turquoise.
   Orange.

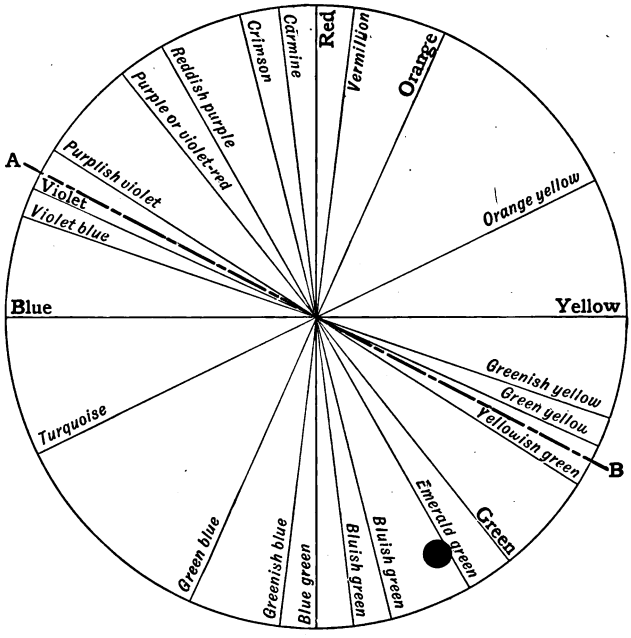

DIAGRAM 12

THE CHROMATIC CIRCLE WITH GREAT DIVIDING LINE

Date Due

MR 3 '66			
JE 1 9 '68			
AG 9 '71			
MY 4 '77			